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E+A Galaxies in the near-IR: Field and Clusters

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Abstract. I present near-IR photometry of a selected sample of E+A galaxies observed in the southern hemisphere. The sample includes 50 galaxies from nearby clusters ($z \sim 0.05$) and distant clusters ($z \sim 0.31$) as well as E+A galaxies from the field ($z \sim 0.15$). I have also observed 13 normal early-type galaxies from the field and from clusters, to be compared with the E+A sample. The photometry includes J , H and K_s apparent magnitudes and colors. I investigate systematic properties of the E+A sample as a function of their environment, contrasting the observed colors with spectrophotometric models of galaxy evolution.

1. Introduction: what is an E+A galaxy?

Most of the E+A galaxies present mid- to early-type morphologies, as it was already shown by some authors ([1], [2]). A little fraction of them have late Hubble types (but see [3]). However, their spectra is peculiar: they do not have emission lines, representative of an ongoing star formation, but they have strong Balmer absorption lines, representative of a young population (A and B spectral types), and also strong Mg b $\lambda 5175$, Ca H & K $\lambda 3934$, $\lambda 3968$ and Fe $\lambda 5270$ lines, indicating that they have a rich population of G, K and M spectral types. This young population suggests that the E+A galaxies are 1 Gyr to 4 Gyr old. Are there other peculiar signatures in the spectra of the E+A galaxies? In particular, are their late-type star populations and their AGB population also different to those of normal galaxies? If so, we can conclude that the E+A phenomenon also involves changes in their older population. In that case, models trying to explain the nature of the E+A galaxies should also fit the signatures observed in the old stellar content.

2. Near-IR photometry of E+A galaxies

In order to investigate the above questions, I have started a program to observe southern E+A galaxies in the near-IR. All the observations are being carried on at Las Campanas Observatory (LCO), using NICMOS3 HgCdTe arrays (256×256 pixels) at both the 1-m Swope telescope (0.599 arcsec/pix, 2.5 arcmin^2 FOV), and the 2.5-m du Pont telescope (0.42 arcsec/pix, 1.8 arcmin^2 FOV). All the observations are carried on under photometric conditions and seeing $\lesssim 1.0$ arcsec, and include J , H and K_s imaging. The sample of galaxies includes E+As from nearby ($z \lesssim 0.05$, [2]) and intermediate-redshift ($z \sim 0.3$, [4]) clusters, as

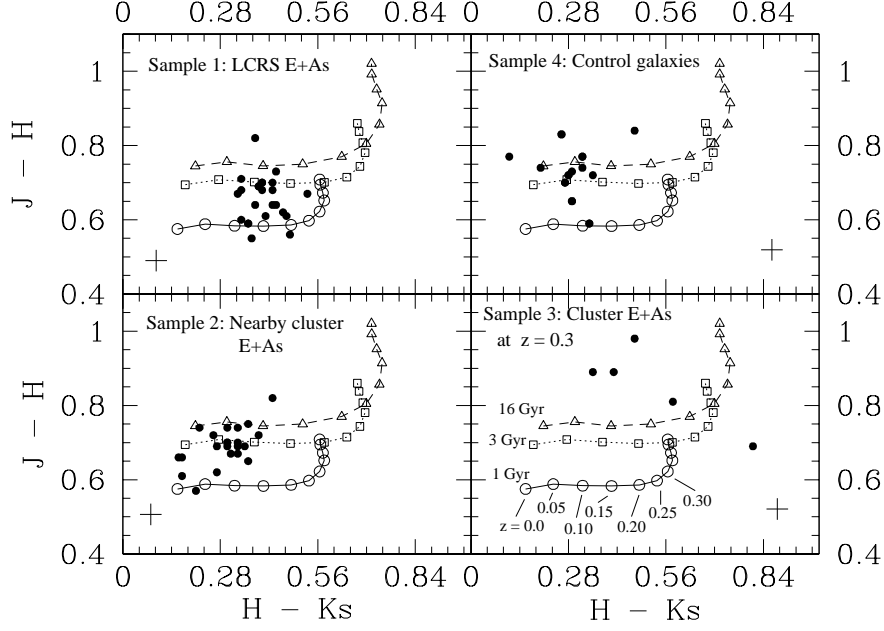


Figure 1. Observed near-IR colors (solid dots) for different samples of galaxies. Sample 1 are field E+A galaxies from the Las Campanas Redshift Survey [5], at $z \sim 0.15$. Sample 2 are E+A galaxies from nearby clusters [2]. Sample 3 are E+As from $z \sim 0.3$ clusters [4]. Sample 4 are normal nearby galaxies. Open connected symbols represent corresponding colors of spectrophotometric models of galaxy evolution (GISSEL96 [7]) at different redshifts. Different symbols correspond to different ages after an instantaneous burst, considering solar metallicity, as indicated in the Figure.

well as E+As located in the field [5], at $z \sim 0.15$. Photometry is performed on the calibrated images using SExtractor [6]. *Total* apparent magnitudes and colors are computed, and compared with spectrophotometric models of galaxy evolution generated using GISSEL96 [7] (see Figure 1). Rest-frame colors are extremely dependent on models, necessary to compute K-corrections. Near-IR spectroscopy will be obtained soon, in order to have reliable K-corrections, allowing to derive robust interpretations from rest-frame colors.

References

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